

## CLAIMS

1. A semiconductor laser device comprising:

a semiconductor laser array having plural active layers, said active layers extending along a first direction on a predetermined plane and arranged in parallel along a second direction perpendicular to the first direction on the predetermined plane;

a collimator lens for collimating plural beams, respectively emitted from said active layers, in a third direction perpendicular to the predetermined plane; and

an optical element arranged at a position where at least part of each beam emitted from said collimator lens and having a predetermined spread angle in the second direction reaches, in an inclined manner with respect to a plane perpendicular to the first direction, said optical element having, on a plane facing said collimator lens, a reflecting portion for reflecting part of each beam reaching from said collimator lens and a transmitting portion for transmitting the rest of the reaching beam.

2. A semiconductor laser device comprising:

a semiconductor laser array stack in which plural semiconductor laser arrays are stacked in a third direction perpendicular to a predetermined plane, each of said semiconductor laser arrays having plural active layers, said active layers extending along a first direction on the predetermined plane and arranged in parallel along a second direction perpendicular to the first direction on the predetermined plane;

a collimator lens for collimating plural beams, respectively emitted from said active layers, in the third direction perpendicular to

the predetermined plane; and

an optical element arranged at a position where at least part of each beam emitted from said collimator lens and having a predetermined spread angle in the second direction reaches, in an inclined manner with respect to a plane perpendicular to the first direction, said optical element having, on a plane facing said collimator lens, a reflecting portion for reflecting part of each beam reaching from said collimator lens and a transmitting portion for transmitting the rest of the reaching beam.

3. A semiconductor laser device according to claim 1 or 2, wherein said optical element is arranged in such a manner that part of each beam reaching said reflecting portion from said collimator lens is feedback to said active layers, and constitutes an off-axis external resonator having a resonant optical path deviated from the optical axis of each beam together with said active layers.

4. A semiconductor laser device according to claim 1 or 2, further comprising a wavelength selecting element arranged in such a manner that part of each beam emitted from said collimator lens and having a spread angle in the second direction reaches perpendicularly, and constituting an off-axis external resonator having a resonant optical path deviated from the optical axis of each beam together with said optical element, said wavelength selecting element Bragg-reflecting part of beam with a specific wavelength, among the perpendicularly reaching beams, in such a manner as to be feedback to said active layers, while transmitting the rest of the beam with the specific wavelength.

5. A semiconductor laser device according to claim 1 or 2,

further comprising a wavelength selecting element arranged in such a manner that part of each beam emitted from said collimator lens and having a spread angle in the second direction is reflected diffractively, and constituting an off-axis external resonator having a resonant optical path deviated from the optical axis of each beam together with said optical element, said wavelength selecting element diffractively reflecting diffracted beam with a specific order having a specific wavelength, among diffracted beams, in such a manner as to be feedback to said active layers, while guiding diffracted beam with the specific wavelength having an order other than the specific order outside.

6. A semiconductor laser device according to claim 1 or 2, further comprising a wavelength selecting element arranged at a position where part of each beam emitted from said collimator lens and having a spread angle in the second direction reaches after reflection at said reflecting portion of said optical element, and causing the reaching beam to be feedback to said active layers via said reflecting portion, said wavelength selecting element constituting an off-axis external resonator having a resonant optical path deviated from the optical axis of each beam together with said active layers.

7. A semiconductor laser device according to claim 1 or 2, further comprising a wavelength selecting element arranged at a position where part of beam transmitting through said transmitting portion of said optical element, among beams emitted from said collimator lens and having a spread angle in the second direction, reaches, and causing the reaching beam to be feedback to said active layers through said transmitting portion, said wavelength selecting

element constituting an off-axis external resonator having a resonant optical path deviated from the optical axis of each beam together with said active layers.

8. A semiconductor laser device comprising:

5           a semiconductor laser array having plural active layers said active layers extending along a first direction on a predetermined plane and arranged in parallel along a second direction perpendicular to the first direction on the predetermined plane;

10           a collimator lens for collimating plural beams, respectively emitted from said active layers, in a third direction perpendicular to the predetermined plane; and

15           an optical element arranged at a position where at least part of each beam emitted from said collimator lens and having a predetermined spread angle in the second direction reaches, and constituting an off-axis external resonator having a resonant optical path deviated from the optical axis of each beam together with said active layers, said optical element having, on a plane facing said collimator lens, a reflecting portion for reflecting part of each beam reaching from said collimator lens in such a manner as to be feedback to said active layers and a transmitting portion for transmitting the rest of the reaching beam.

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9. A semiconductor laser device comprising:

25           a semiconductor laser array stack in which plural semiconductor laser arrays are stacked in a third direction perpendicular to a predetermined plane, each of said semiconductor laser arrays having plural active layers, said active layers extending along a first direction

on the predetermined plane and arranged in parallel along a second direction perpendicular to the first direction on the predetermined plane;

a collimator lens for collimating plural beams, respectively emitted from said active layers, in the third direction; and

5 an optical element arranged at a position where at least part of each beam emitted from said collimator lens and having a predetermined spread angle in the second direction reaches, and constituting an off-axis external resonator having a resonant optical path deviated from the optical axis of each beam together with said active  
10 layers, said optical element having, on a plane facing said collimator lens, a reflecting portion for reflecting part of each beam reaching from said collimator lens in such a manner as to be feedback to said active layers and a transmitting portion for transmitting the rest of the reaching beam.

15 10. A semiconductor laser device according to claim 8 or 9, wherein said reflecting portion and said transmitting portion of said optical element are arranged alternately along the second direction on a plane facing said collimator lens.

20 11. A semiconductor laser device according to claim 10, wherein said optical element comprises a tabular substrate comprised of translucent material and having a surface on which said reflecting portion and said transmitting portion are arranged alternately along the second direction.

25 12. A semiconductor laser device according to claim 11, wherein said tabular substrate of said optical element is arranged in an inclined manner with respect to a plane perpendicular to the optical axis

of each beam emitted from said collimator lens and having a predetermined spread angle in the second direction so that at least part of each beam reaching said reflecting portion enters said reflecting portion perpendicularly.

5           13. A semiconductor laser device according to claim 11, wherein said reflecting portion includes a total reflection film provided on the surface of said tabular substrate.

10           14. A semiconductor laser device according to claim 11, wherein said reflecting portion includes a diffraction grating provided on the surface of said tabular substrate.

15           15. A semiconductor laser device according to claim 11, wherein said reflecting portion includes an etalon provided on the surface of said tabular substrate.

20           16. A semiconductor laser device according to claim 11, wherein said transmitting portion includes a reflection suppressing film provided on the surface of said tabular substrate.

17. A semiconductor laser device comprising:

25           a semiconductor laser array having plural active layers, said active layers extending along a first direction on a predetermined plane and arranged in parallel along a second direction perpendicular to the first direction on the predetermined plane;

          a collimator lens for collimating plural beams, respectively emitted from said active layers, in a third direction perpendicular to the predetermined plane;

          an optical element arranged at a position where at least part of each beam emitted from said collimator lens and having a

predetermined spread angle in the second direction reaches, said optical element having, on a plane facing said collimator lens, a reflecting portion for reflecting part of each beam reaching from said collimator lens in such a manner as to be feedback to said active layers and a transmitting portion for transmitting the rest of the reaching beam; and

a wavelength selecting element arranged in such a manner that part of each beam emitted from said collimator lens and having a spread angle in the second direction reaches perpendicularly, and constituting an off-axis external resonator having a resonant optical path deviated from the optical axis of each beam together with said optical element, said wavelength selecting element Bragg-reflecting part of beam with a specific wavelength, among the perpendicularly reaching beams, in such a manner as to be feedback to said active layers, while transmitting the rest of the beam with the specific wavelength.

18. A semiconductor laser device comprising:

a semiconductor laser array stack in which plural semiconductor laser arrays are stacked in a third direction perpendicular to a predetermined plane, each of said semiconductor laser arrays having plural active layers, said active layers extending along a first direction on the predetermined plane and arranged in parallel along a second direction perpendicular to the first direction on the predetermined plane;

a collimator lens for collimating plural beams, respectively emitted from said active layers, in the third direction;

an optical element arranged at a position where at least part of each beam emitted from said collimator lens and having a predetermined spread angle in the second direction reaches, said optical

element having, on a plane facing said collimator lens, a reflecting portion for reflecting part of each beam reaching from said collimator lens in such a manner as to be feedback to said active layers and a transmitting portion for transmitting the rest of the reaching beam; and

5           a wavelength selecting element arranged in such a manner that part of each beam emitted from said collimator lens and having a spread angle in the second direction reaches perpendicularly, and constituting an off-axis external resonator having a resonant optical path deviated from the optical axis of each beam together with said optical element, 10           said wavelength selecting element Bragg-reflecting part of beam with a specific wavelength, among the perpendicularly reaching beams, in such a manner as to be feedback to said active layers, while transmitting the rest of the beam with the specific wavelength.

19. A semiconductor laser device comprising:

15           a semiconductor laser array having plural active layers, said active layers extending along a first direction on a predetermined plane and arranged in parallel along a second direction perpendicular to the first direction on the predetermined plane;

20           a collimator lens for collimating plural beams, respectively emitted from said active layers, in a third direction perpendicular to the predetermined plane;

25           an optical element arranged at a position where at least part of each beam emitted from said collimator lens and having a predetermined spread angle in the second direction reaches, said optical element having, on a plane facing said collimator lens a reflecting portion for reflecting part of each beam reaching from said collimator



lens in such a manner as to be feedback to said active layers and a transmitting portion for transmitting the rest of the reaching beam; and

a wavelength selecting element arranged in such a manner that part of each beam emitted from said collimator lens and having a spread angle in the second direction is reflected diffractively, and constituting an off-axis external resonator having a resonant optical path deviated from the optical axis of each beam together with said optical element, said wavelength selecting element diffractively reflecting diffracted beam with a specific wavelength having a specific order, among diffracted beams, in such a manner as to be feedback to said active layers, while guiding the diffracted beam with the specific wavelength having an order other than the specific order outside.

20. A semiconductor laser device comprising:

a semiconductor laser array stack in which plural semiconductor laser arrays are stacked in a third direction perpendicular to a predetermined plane, each of said semiconductor laser arrays having plural active layers, said active layers extending along a first direction on the predetermined plane and arranged in parallel along a second direction perpendicular to the first direction on the predetermined plane;

a collimator lens for collimating plural beams, respectively emitted from said active layers, in the third direction;

an optical element arranged at a position where at least part of each beam emitted from said collimator lens and having a predetermined spread angle in the second direction reaches, said optical element having, on a plane facing said collimator lens, a reflecting portion for reflecting part of each beam reaching from said collimator

lens in such a manner as to be feedback to said active layers and a transmitting portion for transmitting the rest of the reaching beam; and

a wavelength selecting element arranged in such a manner that part of each beam emitted from said collimator lens and having a spread angle in the second direction is reflected diffractively, and constituting an off-axis external resonator having a resonant optical path deviated from the optical axis of each beam together with said optical element, said wavelength selecting element diffractively reflecting diffracted beam with a specific wavelength having a specific order, among diffracted beams, in such a manner as to be feedback to said active layers, while guiding the diffracted beam with the specific wavelength having an order other than the specific order outside.

21. A semiconductor laser device according to any one of claims 17 to 20, wherein said optical element is arranged between said collimator lens and said wavelength selecting element, and

wherein said wavelength selecting element is arranged in such a manner as to receive, among beams emitted from said collimator lens and having a predetermined spread angle in the second direction, beam transmitting through said transmitting portion of said optical element.

22. A semiconductor laser device according to claim 17 or 18, wherein said wavelength selecting element is arranged between said collimator lens and said optical element in such a manner as to receive, among beams emitted from said collimator lens and having a predetermined spread angle in the second direction, beam that travels toward said transmitting portion of said optical element.

23. A semiconductor laser device according to any one of

claims 17 to 20, wherein said optical element comprises a tabular substrate comprised of translucent material and having a surface on which said reflecting portion and said transmitting portion are formed.

24. A semiconductor laser device according to any one of  
5 claims 17 to 20, wherein said reflecting portion and said transmitting portion of said optical element are arranged alternately along the second direction, on the surface of said tabular substrate.

25. A semiconductor laser device according to any one of  
10 claims 17 to 20, wherein said tabular substrate of said optical element is arranged in an inclined manner with respect to a plane perpendicular to the optical axis of each beam emitted from said collimator lens and having a predetermined spread angle in the second direction so that at least part of each beam reaching said reflecting portion enters said reflecting portion perpendicularly.

15 26. A semiconductor laser device comprising:  
a semiconductor laser array having plural active layers, said active layers extending along a first direction on a predetermined plane and arranged in parallel along a second direction perpendicular to the first direction on the predetermined plane;

20 a collimator lens for collimating plural beams, respectively emitted from said active layers, in a third direction perpendicular to the predetermined plane;

25 an optical element arranged at a position where at least part of each beam emitted from said collimator lens and having a predetermined spread angle in the second direction reaches, in an inclined manner with respect to a plane perpendicular to the first

direction, said optical element having, on a plane facing said collimator lens, a reflecting portion for reflecting part of each beam reaching from said collimator lens and a transmitting portion for transmitting the rest of the reaching beam; and

5           a wavelength selecting element arranged at a position where part of each beam emitted from said collimator lens and having a spread angle in the second direction reaches via said optical element, and causing the reaching beam to be feedback to said active layers via said optical element, said wavelength selecting element constituting an off-  
10           axis external resonator having a resonant optical path deviated from the optical axis of each beam together with said active layers.

27. A semiconductor laser device according to claim 26, wherein said wavelength selecting element is arranged at a position where part of beam transmitting through said reflecting portion of said  
15           optical element, among beams emitted from said collimator lens and having a spread angle in the second direction, reaches, and causes the reaching beam to be feedback to said active layers via the reflecting portion.

28. A semiconductor laser device according to claim 26, wherein said wavelength selecting element is arranged at a position where part of beam transmitting through said reflecting portion of said  
20           optical element, among beams emitted from said collimator lens and having a spread angle in the second direction, reaches, and causes the reaching beam to be feedback to said active layers via said transmitting  
25           portion.